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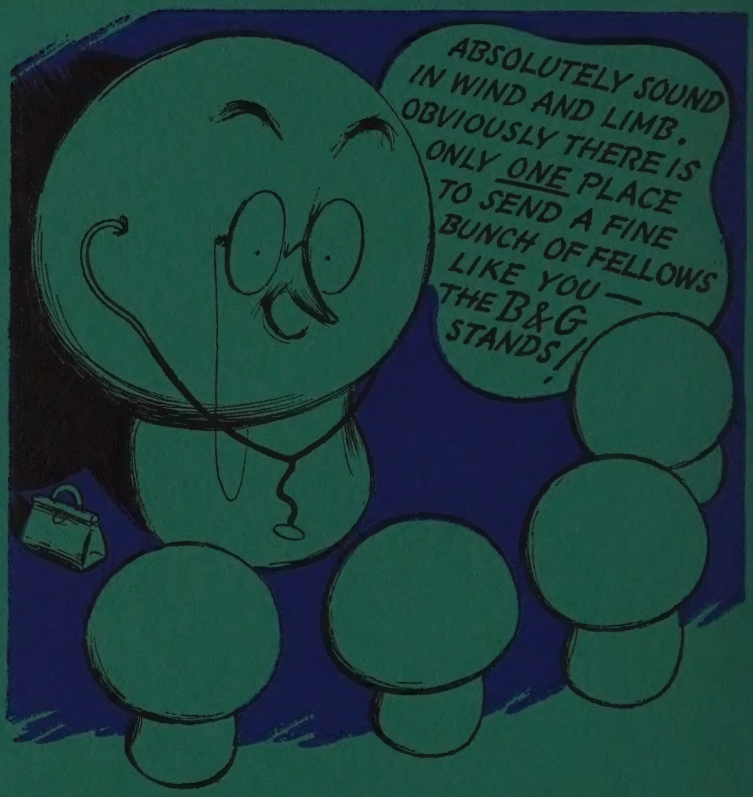

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THE

OCTOBER 1948

BULLETIN No. 13

No responsibility can be assumed by the Editor, the Editorial Board, or the Mushroom Growers' Association, for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

EDITORIAL

Dr. James W. Sinden, Honorary Member of the M.G.A. and Professor of Botany, Pennsylvania State College, U.S.A., recently accepted the invitation of the Mushroom Growers' Association to spend a week in this country visiting growers and discussing problems of mutual interest. This Bulletin had to go to press before Dr. Sinden was due to arrive, but a full, illustrated report will appear in the January issue.

This is another advance in our efforts to stimulate international co-operation, and in this connection members will be interested in a letter received recently from an M.G.A. member, Mr. W. V. Bateman, of Bristol, in which he said, ' On Tuesday last, Dr. Franklin Nelson, entomologist, of New York, visited my nursery and the question of mushroom growing in Pennsylvania arose. It was suggested that it would be a good proposition for those of us who desired to make a party to visit the growers there. I think it would be worth submitting to the members of the Association. I, for one, would very much welcome it.' Already one or two of our more progressively minded members have made it their business to visit the centre of the mushroom industry in America and have returned with glowing tales of the welcome and hospitality they received.

It is interesting to note that Dr. Sinden is one of the most vigorous advocates of the Two-Zone or Tray System of growing, which is revolutionising the American mushroom industry and an article by him appeared in Bulletin 9 describing the whole system. The Ministry of Agriculture have agreed to set aside an allocation of timber each quarter for experimental and development work along these lines to encourage growers, but at the same time they point out strongly that the timber position is far from satisfactory and it may not always be possible to meet the demands of growers. The allocation will be granted for experimental work and not wholesale conversion to the Tray System, which takes a great deal of timber. However, this is a move in the right direction and the Executive Committee of the M.G.A. have accepted the Ministry's invitation to ' vet ' all such applications.

FROM THE SECRETARY

NEWS FROM M.G.A. HEADQUARTERS

Congratulations to Mr. A. DeB. Hovell, a member of the M.G.A. Executive, on his appointment to the provisional Tomato Marketing Board.

The Coke Directorate of the Ministry of Fuel has agreed that if growers are finding difficulty in using the quality of coke issued to them, they should consult with their merchant, because it may be that their requirements will have to be met in either large horizontal gas coke or a hard coke and, if it is established that this is the case, every possible effort will be made to provide them with suitable fuel. Fuel merchants have been notified by the Coke Directorate of this decision and arrangements have been made to assist the merchant to obtain the quality of coke required.

Members will wish to join the Executive Committee in expressing their sorrow at the recent deaths of Major Hugh de Laessoe, D.S.O., M.C., and Mr. J. McGlashan, both of whom joined the Association early in 1945.

Mr. H. H. Glasscock, Honorary Member of the M.G.A. and Advisory Mycologist to the N.A.A.S. in the South-East Province and the Government's authority on mushroom diseases in this country, has been asked by the Ministry to prepare the script of a film strip on mushroom growing. When finished this 'strip' will take the form of a modern magic lantern and will run for about 45 minutes. The script which will be read by the operator is being prepared by Mr. Glasscock in consultation with the M.G.A. Executive. It is intended to cater for growers as well as newcomers to the Industry and will be available at all N.A.A.S. centres throughout the country.

The Third Annual Luncheon promises to be as successful as its predecessors; those wishing to attend are advised to get their tickets early and a good meal is promised by Frascati's Restaurant.

Nominations for Officers and Committee for 1949 should reach this office not later than the 1st November to be effective. Mr. Stanley Middlebrook has intimated that he will not seek re-election as Chairman, holding the view that new blood is always desirable and he will be succeeded in the Chair by the present Vice-Chairman, Sir Oliver Leese. Nominations are therefore required only for the offices of Vice-Chairman and Honorary Treasurer and for the vacancies on the Committee.

Ill-health has unfortunately compelled Mr. W. A. B. Harding to resign from the Committee and so there will now be four vacancies, Mr. Francomb resigning through pressure of business, and Mr. Fryer and Mr. Sinfield retire in rotation, but are eligible for re-election.

STOP PRESS *From our Diarist*

"... Licence is Hereby Granted to Build..."

A Big M.G.A. Success

I want to give unqualified praise and thanks to the M.G.A. and the N.F.U. for bringing to a successful conclusion the biggest single practical job the Association has yet tackled and so justifying its creation and my subscription.

Here is the story briefly. In January last I visited my Agricultural Executive Committee to discover the position of mushroom growers in the county with regard to building and extensions. I was told that the order of 1946, placing mushrooms on the luxury list without encouragement still held. The Committee was unaware that the M.G.A. had fought for and obtained recognition of the mushroom as a food.

Undaunted, I applied to the Ministry of Works for a licence to erect three Handcraft Huts. I asked for no controlled materials and stated that I had everything ready for the job. That was on 10th February. On 23rd April, the application was refused. I appealed on 26th April, and by the 30th was again refused. I promptly visited the licencing office and they repeated what was stated on the refusal forms, namely, that they had granted sufficient licences for the labour available in my district. I suggested that was an entirely inaccurate assumption. Labour **was** available -I could have had any one of three contractors start work immediately. It's beside the point that they denied this. They did, however, stall me by saying that if I reduced my application to one hut they " might do something about it." I accordingly amended the application, which now received the A.E.C.'s backing (their attitude having changed in the meantime), adding that I was able to do 60% of the work with my own labour. This too was refused.

In desperation I passed the whole matter, correspondence and copies of applications, etc., to the M.G.A. They prepared a case and forwarded it to N.F.U. Headquarters. What went on there, what correspondence, interviews and so on with the Ministries of Agriculture and Works, I don't know. But I can say that Mr. Haynes worked hard for the N.F.U. and Mr. Watson, by constant writings from M.G.A. Headquarters, never allowed the matter to rest.

At long last came a message that if I would make out a further application for the original three huts the M. of Works, though seldom re-opening a case, might be disposed to view it favourably.

And here it is. " . . . Licence is hereby granted . . . " Vital, practical help from my own Association. More, it is a colossal triumph for the M.G.A. We fought long and arduously to gain just this position, a medium through which the complaints and problems of the industry and the individual may be voiced—and **heard.**

I cannot overstate the point : without the M.G.A. I should have been a voice in the wilderness. The Association fought first for recognition of the mushroom grower, then for his product. The success of this case is the direct outcome of all the foregoing work.

It's good news for members. We can now **use** the M.G.A.

MUTUAL AID

Members Ask Your Advice

The purpose of this Mutual Aid Section is to provide an opportunity for members to seek the advice of other growers. The success of the section depends entirely upon whether members are prepared to help their fellows by sending to the Secretary their answers to these queries.

Q. 88. Some of my beds are full of spawn which will not penetrate the outer layer of soil and fruit. The spawn has penetrated only half way through the casing soil, and then stopped. I don't know whether the cause is *Xylaria*, which has been causing trouble recently, or excessive D.D.T.

Q. 89. I have been offered horse manure from a racing stable. It is excessively strawy, but the horses are fed on oats. Is it likely to be satisfactory? Should I add some chemical in case fermentation is insufficient? Would the addition of brewers' grains be advisable?

Q. 90. Will you please inform me if there has been patented a hydraulic apparatus for lifting and turning manure, and suitable for fitting to a tractor, as this would save a lot of work in composting?

Q. 91. Has any member experience with hormones added to compost?

Q. 92. (*a*) What is the average cost of a standard mushroom house per square foot of bed surface,
(*b*) the ratio between the internal surface of a house and bed area, and,
(*c*) the fuel consumption per month per square foot of bed during the six winter months?

Q. 93. What do you estimate the labour costs of (*a*) filling, (*b*) emptying and (*c*) disinfecting per sq. ft. of bed in a standard house?

Q. 94. Is it correct to say that larger crops are obtainable from deeper beds, say 18" of manure?

Q. 95. I get good crops at first, but later flushes (although often prolific) tend to consist of small mushrooms, sometimes requiring 80 to the half-pound. Why is this?

Q. 96. What relative humidity do you consider advisable for (*a*) pasteurising, (*b*) spawn running?

Q. 97. Is ground limestone preferable to hydrated lime for adding to casing soil?

Q. 98. I have several beds with superphosphate added to the compost, as recommended in the Bulletin, and am getting much heavier mushrooms. I have had heavier mushrooms before, of course, and am wondering if it is too early to attribute them to the superphosphate.

Q. 99. Can any member tell me whether it is possible to buy Gammexane/Gypsum as a mixture yet? If so where am I likely to obtain it?

Q. 100. What evidence is there to show that electric heating gives a drier heat, or drier air, than do hot water pipes? If this is so, what is the reason for the difference?

Answers to Previous Questions

Q. 79. *Can you give me any information on Xylaria vaporaria? I believe it is a manure fungus, but am particularly keen to know whether it can be introduced through soil.*

This fungus is a serious competitor of the mushroom in beds it has entered. The white mycelium grows rapidly through the compost taking the food for the growth of the mushroom mycelium. When the fungus invades the casing soil it produces black, fleshy bodies, or sclerotia. These vary in length and have an objectionable smell. The disease is very difficult to control, because the real damage is caused by the mycelium in the compost. The source of the fungus is not obvious although the casing soil is suspect. NOEL D. HARDING.

Xylaria vaporaria was very commonly met with in mushroom beds in England 15 to 20 years ago, but is now of infrequent occurrence. My experience has shown it is capable of lying dormant and able to form spores while the sclerotia are in soil. It may possibly be present in old pasture because I have seen mushroom beds infected when made on the ground in new glasshouses built on grassland. The warmth of the beds probably induces growth of the sclerotia and the compost soon becomes filled with white mycelium resembling a good growth of mushrooms but having a strong and characteristic smell. The *Xylaria* crowds out the mushroom mycelium and it later forms a black branched sclerotia in the compost and under the casing . . . . The grower's main problem here is to know whether any more *Xylaria* will be met with in the soil on which the outdoor beds will be laid in future. It is impractical to make tests and there must always be this risk with outdoor beds.
Dr. W. M. WARE.

Q. 80. *What is the best layout for a mushroom house?*

There would appear to be no improvements on the conventional design, i.e., 40′ to 60′ long and 20′ wide and of sufficient height for 3 or 6 tiers of shelves (7′ to 13′ to the eaves); or where the tray system is practised, 10′ to the eaves. The tiers or stacks should have a working space of 3′ between rows and the passageway along each side wall should be at least 2½′ to allow for ample clearance for the heating pipes. For convenience in working from both sides, the beds should not be more than 5′ wide. It is false economy to have too narrow pathways.
W. A. B. HARDING.

Q. 81. *When starting to grow mushrooms, is it wiser to heat by thermostatically-controlled electric radiators at first and later change to steam heating?*

During the present acute shortage of water piping and its fantastically high second-hand price it would be cheaper to instal electric radiators. Against this however, running costs are much higher, electric heating tends to lower humidity and there is the uncertainty of a constant supply of heat due to periodic electricity 'cuts.' Also there is the proposal to increase the price of electricity during the winter months. It would be wiser to ensure self-sufficiency by installing hot water at the outset heated by coal and/or oil, preferably the latter, as it is a great saving in labour and can be used economically for 'boosting' after filling in the summer. There is available an efficient low priced oil conversion unit fed by gravity which can be fitted to the existing boiler without extensive alterations. W. A. B. HARDING.

If the member can obtain a suitable coal-burning boiler I would advise him to start and continue with same. I don't really like the idea of thermostatically controlled electric radiators in mushroom houses as conditions are too unnatural also the power is likely to be cut off at times when it is most needed (e.g., heat-up after filling). N. D. HARDING.

Q. 82. . *A smooth concrete floor and plaster walls would be preferable to the wooden floor and wainscoting in the building I proposed to adapt for mushrooms, presumably. But as some of the houses are timber, is this expense justified ?*

A sloped concrete floor is essential for cleanliness. N. D. HARDING.

Yes, remove wood floor and wainscoting—they might make you some bed boards. F. C. ATKINS.

This expense is more than justified because, apart from rapid deterioration of timber by the routine hygiene of washing down, woodwork is adverse to the efficient control of pests and disease. It is strongly advised that the timber should be stripped out and reserved for a more useful purpose such as bed boards, or traded to balance the cost of the alterations. W. A. B. HARDING.

Q. 83. *Is it advisable to warm water before applying to the beds ?*

No. It is well known that the cold shock thus produced quickens the growth of the mushrooms. It rarely fails. NOEL D. HARDING.

In commercial practise it is doubtful if any grower has the means for warming the quantity of water required, apart from the additional labour required for pumping it from the storage tank, indeed most growers find mains water essential and feel that the ' cold shock ' encourages fructification. W. A. B. HARDING.

Q. 84. *Is there any accepted formula for the amount of ventilation required, or any correct ratio between bed and air space ?*

The only guide to ventilation is that the air in a mushroom house should always feel fresh. To this end a ventilator should be provided to the roof, running the whole length of the ridge. Bottom vents along the side walls should be spaced no greater than 10' apart and each should be of fairly ample dimensions, say 2' by 1'. Bed to air space ratio to be at least 1 : 8. W. A. B. HARDING.

The American recommendation for the ratio of air to bed space is $3\frac{1}{2}$: 1, but more is probably safer. R. DUTHY.

Q. 86. *I would like your candid opinion as to the advantages of corrugated iron for ' bunks ' over chain link fencing.*

When I re-established a plant on my present premises, 2 years ago, I was faced with the same problem as to a substitute for bed boards. For what it is worth, my experience with both materials has proved that corrugated 14 gauge iron or galvanised sheets (or asbestos) are infinitely preferable to chain link fencing and are well worth the double expense in that they quickly compensate for the extra outlay in saving time and labour when handling : (a) being laid loose, they can be stacked back for filling, and moved when cleaning out ; netting would be rigidly fixed and cause obstruction besides making it advisable for the packer to stand in the shelves when making the beds, (b) are infinitely more durable, and if painted will not suffer early corrosion, (c) rigidity of shelving. With chain link fencing it is impossible to prevent sag (this being intensified if the packer stands in the beds when filling) however well-strained the material be fixed, as the end uprights will ' whip ' with this strain and an ever increasing sag will develop. Regarding a layer of straw between compost and sheets, this is not really vital because this base layer is seldom actually exhausted even on timber. Provided the compost is reasonably thick (7"after firming down) and there is a good growth of spawn to within the bottom $1\frac{1}{2}$", it does not seem to really matter if there is sourness at the base of the compost layer.

W. A. B. HARDING.

Q. 87. *I am having to pay £12 a ton for my compost ; is it possible to let me have some form of estimated ' receipt and expenditure ' account assuming a grower has 2,000 sq. ft. under cultivation—to help me decide whether to go ahead with my plans to grow mushrooms ?*

Mushrooms will not show a profit if £12 a ton has to be paid for compost. This is sheer robbery. At the usual price for contractor's manure the accounts per crop for a 2,000 sq. ft. unit should be approximately :—EXPENDITURE : Manure, £120, soil £20, fertilizers, fungicides, etc. £20, spawn £16, chips and packing materials £25, fuel £25, wages £194 (not including proprietor), transport ex farm £10, and rail charges £6 = £430. RETURNS : At the present price which is showing a continuous decline and an average yield of $1\frac{1}{2}$ lbs./sq. ft. = £600. W. A. B. HARDING.

I think £12 for composted manure too dear. This price is governed by the supplier's first cost plus the cost of turning the manure four or five times. About £6 a ton would be as far as I would want to go. C. P. CHAMBERLAIN.

FUEL FOR MUSHROOMS

STUPID FORMULA SUCCESSFULLY RESISTED

Complaints that fuel for heating mushroom houses was in future to be allocated on a basis of 10 cwt. p.a. per 1,000 sq. ft. of bed area reached M.G.A. Headquarters early in June.

Our Secretary reacted with the most commendable alacrity. Within 36 hours he had visited Bedford Square and enlisted the sympathetic support of the N.F.U. Secretary for Horticulture, Mr. H. R. Haynes, and a vigorous complaint had been lodged with the Ministry of Agriculture.

As the Association's representative on the Union's Glasshouse Produce Committee, I was asked by the Executive Committee to support Mr. Watson in his representations, and on the Union's advice we made an attempt to evolve a formula applicable to mushroom growers along the lines of that which had been accepted by glasshouse growers, viz., 180 tons per acre.

All members were immediately notified of the critical situation which had arisen, and were asked for details as to area cultivated and fuel required. The majority replied with full data within seven days—a most encouraging example of the Industry's keener appreciation of the necessity for facts with which to support our representations in official circles.

The information thus collected provided much of interest and value. Those who grow on tier beds cultivate on the average 9,985 sq. ft. Those who grow on the floor cultivate on the average 5,747 sq. ft. The average amount of fuel required was 1 ton for every 212 sq. ft. (These figures do not relate to cultivation under glass.)

Everyone agreed that 1 ton for 2,000 sq. ft.—the formula suggested by the Ministry of Fuel—was absurd. Alternative formulae suggested by members were 1 ton per 100 sq. ft. of floor space, per 1,000 cubic feet capacity of house, per 200 sq. ft. bed area, and per 10,000 B.T.U. rating of boiler. Others suggested that allocations should be based on output to encourage higher production, or that it should be based on the outside surface of the houses and the insulating efficiency of the walls.

A number of useful points were made. The *quality* of the fuel was considered most important. If anthracite were not available the allocation should be increased, coke being less efficient. Increases in any agreed formula should be permitted to farms in exposed positions. Extra fuel should be allowed for soil sterilization, as under the glasshouse formula. The fact that mushrooms were grown at a lower temperature than tomatoes was counterbalanced by the necessity for a temperature of 120°F. for the first few days after a house was filled, and of 65° to 75°F. for the seven following weeks prior to picking. The basic essential for a mushroom house was first-class insulation, which negatived much natural aid from the sun as was obtainable in glasshouses.

Mr. Watson and I worked on this mass of material for several days, but eventually we had to drop the idea of a formula. With the approval

of the Executive Committee, a plea that fuel applications by mushroom growers be treated on their individual merits was made to the Ministry *via* the Glasshouse Committee. Our memorandum was along these lines :

The question of fuel for mushrooms arose out of complaints from several growers in one area (West Sussex) who informed us of a local formula of 10 cwt. fuel per 1,000 sq. ft. of bed area. This formula, of course, is totally inadequate and in view of the fact that if one grows mushrooms under glass one is allowed eight times this amount of fuel, quite unjustifiable.

When this information was conveyed to growers throughout Great Britain, none outside West Sussex reported that such a formula had been introduced to his district, and in a number of cases we were told a reasonable allocation had been granted.

Primarily for this reason we feel it would be advisable to deal with West Sussex complaints as an isolated instance of discrimination against mushrooms grown elsewhere than under glass (where the 180-tons-per-acre formula operates, equivalent to 1 ton per 242 sq. ft.)

From the data available to us we feel that no formula can be evolved for fuel for mushrooms which would be practicable. A formula for glass is feasible because there is not a vast difference between one glasshouse and another, except as regards their locality and their state of repair, and even with glass there are permitted variations to the present formula.

Mushrooms, on the other hand, are grown commercially in darkhouses specially designed and constructed of brick, or concrete, or asbestos, or timber, in adapted tunnels and caves, in converted breweries, mills, stables and barns. The degree of success in conversion is highly variable. Any *average* figure for the amount of fuel required to heat an acre of beds would be greatly in excess of the amount required by the more efficiently insulated darkhouses, but quite inadequate for some of the converted buildings.

The net result of allowing 180 tons per acre to the former, and permitting extra quantities to meet the peculiar needs of the latter, might well result in an all-over increase in the present total of fuel allocated to mushroom growers.

The Ministry gave sympathetic consideration to our case, and no more is likely to be heard of what we may term the Sussex Formula.

THE POSITION TO-DAY IS THAT MUSHROOM GROWERS—EXCEPT THOSE UNDER GLASS, WHO AUTOMATICALLY ON APPLICATION RECEIVE 180 TONS AN ACRE—MUST MAKE INDIVIDUAL APPLICATION FOR THE AMOUNT OF FUEL THEY REQUIRE. THEY ARE ADVISED TO OBTAIN C.A.E.C. SUPPORT, WHICH HAS BEEN ASSURED BY A MINISTRY CIRCULAR RECENTLY ISSUED TO THEM TO THE EFFECT THAT COUNTY COMMITTEES " MAY NOW REGARD MUSHROOMS AS A FOOD CROP TO WHICH APPROVAL MAY BE GIVEN FOR THE PURPOSES OF THE FUEL UNDERTAKING."

FOOTNOTE : We have been officially informed there is no truth in a recent Press statement that, as a result of negotiations with the Ministry of Fuel, the allocation to mushroom growers of solid fuel for heating their sheds " is now the same as that for glasshouse crops."

FRED. C. ATKINS.

Dr. & Mrs. Bels Visit M.G.A. Secretary

Mushroom Growing is encouraged in Holland, and the Dutch Government's technical advisers on this crop, Dr. P. J. Bels and his wife, Dr. H. C. Bels-Koning, visited England recently to gain a closer impression of our cultural methods. A visit to Yaxley, the administrative headquarters of the Mushroom Growers' Association of Great Britain and Northern Ireland, took place during the first four days of July, and on their last evening the visitors were entertained to dinner at Peterborough by the M.G.A.

In an interview, Dr. Bels said he and his wife had just completed a course of lectures given to 50 glasshouse growers in Holland, 20 of whom are to make their first attempt to grow mushrooms on a commercial scale next winter. In the meantime research continues under the supervision of Dr. Bels, for whom a laboratory has been provided and equipped by his Government.

The cost of producing a pound of mushrooms in Holland is about 2/6, rather less perhaps than in England, mainly because horse manure is one-third cheaper over there. The wholesale price is 5/- and the retail price in the shops for best mushrooms is around 6/-.

There is concentration at the moment on encouraging the glasshouse production of mushrooms during the winter, to ensure continuity of employment for the nursery's labour and to utilize cropping space rather than allow the glasshouses to lie idle for the October-February period. In glasshouses the cost of production is likely to be reduced to 1/6, but only when there is good insulation (for the winters there are severe), when manure is bought cheap in the summer months and a good yield (say 2 lb. per sq. ft.) is obtained from the shelf system.

The Dutch Government desires higher and more efficient production to reduce the present high prices ; the growers are not so anxious !

Pests remain quite a serious problem, particularly as it is not possible in the great majority of cases to obtain a " sweat out " or " peak heat " after the beds are laid. The reason for this is the type of cropping house used. In many cases the beds are laid on the floor in caves.

In Holland mushrooms are picked before the veil begins to break, and open mushrooms are suitable only for processing into soups, ketchup, etc. The reasons given by Mrs. Bels were two-fold : " We don't peel our mushrooms, but wash them, and if the veil is broken the water gets into the gills, and the mushrooms cannot be properly dried. Also it must be remembered that we don't cut off the base of the stalks, and the gritty casing soil adhering to the stalks would get into the gills during transit from farm to kitchen."

Air Conditioning in Mushroom Houses

" *The Grower* " reported in June that some initially encouraging results had been achieved in the field of air-conditioning of mushroom houses, and that air extraction and circulation by electric fans was being tried in West Sussex in one or two thermostatically-controlled cold-house structures.

The author of that note was approached by the M.G.A., and his reply was as follows : "Air conditioning is still only in the very experimental stages and although certain encouraging results have been achieved, I feel that the moment is premature to publish an article which might possibly prove, in the event, to be misleading and which could conceivably result in losses to growers who might be encouraged to spend a lot of money on equipment which failed to produce satisfactory results in different types of structure from those in which the system has been tried. I would be very diffident about putting anything on paper unless it were possible to furnish complete data on the subject, and I incline to the view that, as the principles of air-conditioning are well known nowadays, the best course for any grower desirous of installing it is for him to get in touch with a competent engineer capable of devising a system to suit the individual lay-out."

The Mushroom Industry To-day

The M.G.A. presents its Case for an Increased Tariff on Imported Mushrooms

There is a considerable trade of mushrooms in this country, and the fact that the supply is unequal to the heavy and continuous public demand for the product would have been an encouragement to the development of the Industry if the Government had not stifled such enterprise during the War years by the imposition of every possible obstacle and restriction and by its persistent refusal to recognise the nutritional value of the mushroom or the importance of the Industry.

When the War ended, established growers came together and began to take steps to rectify this position and make up lost ground, and have now organised a virile Mushroom Growers' Association as a Specialist Branch of the National Farmers' Union to look after the interests both of established concerns and of new entrants in this interesting field, particularly ex-servicemen, who comprise about half the new-comers.

Some classification of the several forms of mushroom growing is necessary to the proper treatment of the subject :

(1) **OUTDOOR CROP.**

(a) **Wild Mushrooms—Natural.** Mushrooms occur naturally in pastures in certain areas where soil and climate are suitable. Supplies from this source appear on the markets between June and October. They are generally fairly cheap and, in a favourable season, plentiful ; no attempt is made to grade or pack them properly. With these uncultivated mushrooms are also associated certain other edible fungi which, however, are less well-known.

(b) **Wild Mushrooms—" Cultivated."** Fields where wild mushrooms are known to grow are frequently specially treated in order to encourage heavy crops ; but only to this extent can they be referred to as " cultivated." This natural output is also often increased by the planting of " spawn. ' Sometimes fields which normally produce no mushrooms are spawned and manured in order to provide a crop. All such methods are gambles, the prevailing weather being the determining factor. It is only fair, however, that the " cultivator " is protected by law against loss through public gathering of the produce.

(c) **Ridge Beds :** Cultivated mushrooms are often grown, but on a smaller scale than 20 years ago, from spawn planted in ridge beds formed from specially-composted manure. Results from this method are much more dependable than wild crops, principally because of the recent introduction of powerful insecticides, but their season is restricted to the Summer and early Autumn.

(2) **PROTECTED CROP.**

(a) **Non-specialised production :** Mushrooms are often grown on a small scale in the smaller mixed nurseries and holdings, usually in

hothouses and glasshouses which are temporarily free, in order to provide the necessary income to pay wages during the winter months. They are generally referred to as a " catch " or " chance " crop. In many of the larger Commercial glasshouses, however, mushrooms have been seriously studied, and although no figures are available, it is generally believed that from these, a high proportion of the winter output is gathered. This supply is consigned mainly to the London and principal provincial markets, while the small local markets obtain their supplies chiefly from the small-scale nurserymen.

Mention must be made also to the half-dozen or so disused mines and caves where the French practice has been adopted.

(b) **Specialised production :** To an increasing extent in recent years, production of mushrooms has been developed by specialist growers who, by studying scientifically the particular requirements of the crops, were able successfully to design suitable buildings and devise economic methods of production. The tendency in this country is to build the American-type tier-bed house, but with fewer tiers and better insulation.

This specialised production was initiated primarily by experienced growers already well-equipped with knowledge of the crops requirements, but as a belief became widespread concerning " substantial " and " easy " profits to be made from mushrooms there occurred a series of financial " ramps " engineered by persons without interest in, or knowledge of, horticulture in general and mushrooms in particular. The character of these attractively-advertised transactions is well-known ; suffice it to say of their effects that they secured investors more easily than mushrooms, and created an atmosphere of suspicion about the Industry in general in which the genuine growers were the principal sufferers.

This was a phase which was bound to pass, and the Second World War arrived just as the mushroom-growing industry was beginning to progress on sound business lines, producing regular crops throughout the year and meeting the demand at fair prices.

ACREAGE AND PRODUCTION.

Hitherto no records have been available of the acreage and annual production in this country, and it is not possible, therefore, to assess the extent to which the industry has expanded. The fact may nevertheless be accepted that total production in 1946 was very much lower than it was in 1939, because of Cropping Orders and the frustrations which still beset the grower after six years of war-time discouragement.

It is probable that there are 1,000 serious commercial growers in England and Wales, perhaps 10-15% growing in specially designed houses.

In 1939 one of the major sundriesmen estimated that 13,000,000 lb. of cultivated mushrooms were grown in Great Britain, none of which was exported, and that 75% of this crop was from glasshouses. The Mushroom Growers' Association, realising that without figures there can be no solid ground to their pleas and arguments, is now engaged in an

attempt to compile reliable statistics. All that can be said at the moment is that from a comprehensive cross-section analysis, 41% of the total area devoted to mushrooms was in glasshouses, 30% in specially designed houses, and 29% elsewhere.

DISTRIBUTION OF PRODUCTION.

Specialised production is widely distributed all over the country but is associated more particularly with Sussex, Yorkshire, and the area around London—Essex, Kent and Herts. In the South it started mainly in association with glasshouse holdings where mushrooms were, and still are, to some extent grown as a seasonal crop in glasshouses. Elsewhere, particularly in Yorkshire, it is based on the existence of buildings such as rhubarb sheds which could be adapted for growing the crop, as well as in buildings specially erected for the purpose.

SEASON OF SUPPLY.

Cultivated mushrooms from indoor beds are available all the year round. Such crops, during the scarcity conditions created by the War and by Government policy in war-time, commanded high prices. The fact that the average to-day is little more than half the peak prices during the War, coupled with rapidly rising costs, is providing those with vision abundant food for thought.

Mushrooms grown outdoors are available from May to October.

TECHNICAL DEVELOPMENT.

Of all horticultural crops, mushrooms are probably subject to more severe losses than any other, firstly because conditions suited to the production of mushrooms are confined between narrow limits, to stray from which generally means complete failure of the crop. Secondly, mushrooms are prone to very destructive fungus diseases, which cannot be eradicated by the customary fungicides because the mushroom itself is a fungus. Fly and mite can also do tremendous damage if uncontrolled.

Stable manure has always been regarded as the only medium in which mushrooms could be cultivated economically, but as this material becomes more difficult to obtain in sufficient quantity and at a reasonable price, the necessity to find a reliable substitute becomes an urgent problem.

Research into these handicaps to successful production was undertaken on a limited scale at Wye College and at Cheshunt before the War. Cheshunt has now re-started. There was no centre at which attention was devoted solely to mushrooms, and in consequence a number of specialist growers in 1946 established the Mushroom Research Association Ltd. at Yaxley. The intensive character of this research is an indication of its importance.

IMPORTS.

Up to 1931, about 600 tons of mushrooms were imported each year, mainly from the Continent. These supplies upset the market so seriously

that in 1932 an Import Duty of 8d per lb. was introduced, and the flow of subsequent supplies slackened to 15 tons p.a. They were stopped altogether by the War, but the floodgates were opened again in 1946, before the home grower had been given a chance to recover from his recent suppression.

Unlike the Duty imposed on imports of other horticultural products, that on mushrooms has not been altered since 1932.

THE WAR PERIOD.

The War period produced considerable dislocation of the mushroom growing industry, viz. :—

(a) **Outdoor (Field) production.** Much of the mushroom bearing pasture had to be ploughed out for more essential food production, causing loss of capital represented by fertiliser and spawn, and loss of income.

(b) **Outdoor (Ridge-bed) production.** Being classified as a non-essential crop, no provision was made in respect of labour and supplies to enable this form of production to be continued. It therefore persisted only on a small scale.

(c) **Indoor (Glasshouse) production.** In glasshouses the crop is subsidiary to the main crop in the annual cycle, and as such it could still be fitted in to some extent under the cropping restrictions, but on a much reduced scale. It was specifically prohibited between 1943 and 1945.

(d) **Indoor (non-Glasshouse) production.** Specialised production in specially constructed, and in adapted buildings, suffered a particularly severe setback which may be summarised as follows :—

(i) The crop not being regarded as essential, no provision (or very little) could be made for retention of the labour force, and for the particular supplies required for production, including fuel, insecticides and fungicides. In a number of cases all directable labour was withdrawn, including the working proprietors.

(ii) The fact that this form of production was frequently the only crop grown meant that restriction of production was not accompanied by any compensating features.

(iii) Of all forms of mushroom growing this particular one involves the greatest initial expenditure on plant and equipment (and experience, for apprenticeship can be very costly). As it was for the most part of comparatively recent development, the reduced return on capital resulting from low output --or none at all—was the more regrettable.

It should be emphasised that mushrooms were not a "permitted crop," and received no official concession in regard to fuel or other materials of production.

In general, all facilities were withdrawn and production continued as best it could, except in glasshouses during the period of prohibition. The inevitable result was a much reduced supply. The position of the bona-fide grower was grim indeed. Prices rose 3-400%, but costs of production meanwhile soared to very high levels, and it was impossible to run a plant economically.

RECOMMENDATIONS.

(1) **Future prospects.** Increased production to bring down prices to a reasonable level satisfying both producer and consumer is the policy of the Mushroom Growers' Association. It can be achieved in the following ways :

(a) The industry presents opportunities for the new-comer with determination who is prepared to start in a modest way and is content to work especially hard for the first year or two while suffering many disappointments and receiving a meagre return on his capital. This warning is given because in its absence between the last two Wars numbers of men were seduced by the get-rich-quick propaganda based on mushrooms.

(b) Increased efficiency in the management of established farms, and further mechanisation, are dependent on research. Technical development is a matter of extreme urgency, and growers generally view with dismay the complete lack of progress being made towards the establishment of the proposed national Glasshouse Research Station, at which mushrooms will find a place. It must be borne in mind that the two major expenses on any mushroom farm are manure, the cost of which has gone up 300% in ten years, and wages, which have risen from 34 9 to 90 -. Wages must not come down, but as horse-manure is increasingly difficult to obtain at an economic price, a cheaper alternative medium is absolutely essential before there can be any hope of a considerable reduction in the price of mushrooms. Solution of this problem is closely linked with the stepping-up of yields from the present average of 1½ lb. per sq. ft. of bed—and both depend upon research.

(c) Farms can be run more economically if growers receive more concrete encouragement. The Industry hopes to share in the allocation of materials when circumstances permit the development of glasshouses, just as the feeling is shared that home-produced food should be a "priority." Improvisation has been the only way to keep going ; it is extravagant, and should not be enforced a moment longer than is necessary.

(2) **Future Protection.** The proposed *ad valorem* Duties (10% and 20%) will be quite inadequate once the Continental growers return to full production. Now that the Mushroom Industry is at last "recognised" as an integral part of Horticulture, a claim for a specific Duty of 2 - could be fully justified. The home-grower, given encouragement, can not only meet the national demand but provide it quite fresh and suitably trimmed ; the average housewife dislikes the gritty, long-stalked imported mushroom. Improved packing awaits the release of the best materials.

What disturbs the grower above all else is the lack of consideration accorded him by the Ministry of Food and the complete absence of policy announced in advance. Imports from France, Holland and Denmark have been followed by the "promise" of mushrooms from Eire.

MUSHROOMS IN AUSTRALIA

Fred. C. Atkins asks Raymond Mas some questions

Mr. Raymond Mas has joined the M.G.A. to keep us in touch with the mushroom growers in Australia, where he was the pioneer spawn-maker and to-day is a leading figure in his country's mushroom industry. He is to write for the Bulletin an article on Mushroom Growing in Australia, and suggests it might take the form of a reply to " a critical review " of the book on growing which he published in Sydney in 1936. His challenge is accepted in the friendly spirit in which it was uttered.

Mr. Mas believes his work was the first in the world to deal with the use of various manures other than horse, although credit is usually given to Dr. R. J. Noble, of Australia. On page 15, he reports that the following mixtures are being used by growers who supply 90% of the mushrooms sold in Sydney : —horse manure, 4 tons to 1 ton of straw will make 650 sq. ft. ; cow manure, 5 tons to 1 ton of straw will make 600 sq. ft. ; fowl manure, 2 tons to 1 ton of straw will make 370 sq. ft. Manure from turkeys and ducks should be used as per fowl manure. (Figures are for 7 inch beds.)

Until 1934, horse manure was considered better than any other for mushrooms, he says, but he now knew that cow manure produced just as good a crop, " and the mushrooms have a nicer pink on the gills." Fowl manure had also proved " very good." Horse and cow manure must be fresh, but it did not matter how old fowl manure was, as long as it was kept dry.

The section on composting is very good and reliable, except where the author says heaps of manure will ferment more readily if they are not pressed down. Those growers who have had experience with fresh straw composts will support me when I suggest that such heaps will dry out too rapidly unless they *are* trodden. In the same context Mr. Mas advises the grower to tread down compactly after making the beds ; this is not a practice which many of us follow to-day.

The sections on soils and watering are also as good as most I have read, but at this point I propose to ask a few questions of Mr. Mas.

1. Is he still of the opinion that fresh, moist spawn crops earlier *and longer* than dry?

2. Will he now admit that it was mere propaganda which led to the inclusion of this note : The future success of the mushroom industry depends *entirely* upon the faithfulness in preparing pure-culture (spawn) for the growers?

3. Are dark sheds kept dark " merely to keep them cool?" Doesn't the fact that direct sunlight badly discolours the mushrooms enter into it at all?

4. Should *all* casing soil be limed at the rate of about 10 lb. (of slack garden lime) to every yard of soil?

5. Does the Phorid Fly not deserve a passing reference among the more serious insect pests?

6. Is it fair to tease us with the information that the Mas Insect and Vermin Killer (obtainable from all seedsmen) is *perfectly successful*

against mushroom fly, and that now " growers can proceed, free from apprehension, knowing that whatever the difficulties may be, they will be able to overcome them ?"

7. Is there really a *bacterial* disease known as " Bubbles " *or* " Flock " ?

8. Contrary to your advice, does not perfect watering imply getting your water down to the point of contact of the casing with the compost ?

Perhaps when Mr. Mas comes to answer these questions he will help us with another which often gives rise to much argument. Who first decided that spawn should be broken into pieces the size of walnuts and set 8" apart ? Would larger lumps wider apart give better results—or smaller lumps closer together—or fragments broadcast as with grain spawn—do the job just as well ? And are mushroom growers in Australia, as in Great Britain, beginning to question these hoary old dicta ?

Summing up, this book by Mr. Mas : *Mushroom Growing, Insect Pests and Diseases* –he has presented a copy to the M.G.A. Library - is generally reliable, particularly in view of the fact that it was written 12 years ago. But to one grower at least it appears to present far too rosy a picture of the prospects for newcomers. The author states : " Mushroom growing can be practised without the hardships which market gardeners, fruit growers and other farmers are subjected to ; little money is required to start as a grower, and the returns are quick." I prefer to give Sir Oliver Leese's advice to ex-Servicemen in a recent *Radio Times* interview : " Sir Oliver is anxious not to arouse false hopes . . . . He advises them not to entertain the idea unless they are prepared to take some pretty intensive courses, and to put down a lot of money."

TECHNICAL ABSTRACTS

from THE REVIEW OF APPLIED MYCOLOGY

Truffle made its first appearance in the Argentine in 1946. An outbreak in mushroom beds at Villa Adelina, Buenos Aires, is recorded.

MUMMY DISEASE COMES TO EUROPE

C. Fleury, in charge of the Section of Bacteriology, Lausanne Research Station, Switzerland, records the presence in mushroom beds of the " mummy disease " hitherto unknown in Switzerland. The interior of the misshapen, rotting sporophores is very often accompanied by small, blackish cavities replete with bacteria, probably *Pseudomonas*, which are, however, merely secondary and give negative results in inoculation experiments.

ADDITIONS TO THE LIBRARY.

Byers Wrought Iron for Radiant Heating (presented by Mr. P. P. Capossere) ; G. R. Rettew and F. G. Thompson—*Manual of Mushroom Culture* (presented by The Mushroom Supply Co.) ; R. Mas—*Mushroom Growing, Insects and Diseases* (presented by the author) ; *The Vitax Handbook*, 1948 ; *Practical Soil Sterilization* (Ministry of Agriculture Bulletin 22) ; *Memorandum on Natural Organic Fertilizers* (presented by Mr. H. J. Holford).

VERT DE GRIS IN THE U.S.A.

by Dr. T. F. MANNS

Consultant to the Mushroom Research Dept. of Grocery Store Products Co. West Chester, U.S.A.

For the past three years or more the Grocery Store Products Co. of West Chester, Pennsylvania, has been subject to increasingly severe losses from a diseased condition of the mushroom beds caused by a fungus which in severe cases forms a mat just beneath the casing soil. When infested soil is used in the compost, spots of the disease may be found throughout the compost.

The causal organism has been isolated and in the writer's opinion the diseased condition is identical with a disease of mushroom beds and spawn described by Costantin and Matruchot in France in 1894.

The fungus here is tentatively identified as *Myceliophthora lutea* Cost. There are two forms of the fungus in this district, one form with smooth chlamydospores as described by Costantin et al., and another with chlamydospores having ebullitions or spines on the margins.

From conversation with Dr. J. W. Sinden and Dr. E. B. Lambert, it was learned that the disease was causing severe damage in mushroom plants at Barberton, Ohio, and at South Lebanon, Ohio, ten years ago. The growers have not been able to eliminate the disease entirely from their beds, but have greatly reduced the severity of the infestation by sanitary measures and by increasing the temperature in their houses during pasteurization.

In severe cases the losses to growers may be as high as 50 to 75 per cent. of a crop. Because of the serious economic aspect of the situation the Grocery Store Products Co. has engaged the writer to make an extensive study of the disease to determine its cause, transmission, and control.

Preliminary studies show the disease in its severe form (" mat disease ") is primarily a heavy infestation of the casing soil, and not of the compost. Under no consideration should such soil be used in supplementing composts, as a " top heat " of 140° F. in the bed does not completely control the disease in the compost. Also a steam heat of soil in autoclave for three hours at 140° F. does not control the disease. Further work is in progress to determine the killing point in the soil and in the compost.

The writer has introduced the method of injecting a formaldehyde solution into high pressure steam boilers at 75 to 100 lbs., and then forcing this steam through the soil by properly perforated pipes. The formaldehyde in boilers is also being used to disinfect houses more thoroughly. This method for sterilizing soil and houses under " sick " conditions is showing much promise.

(1) Costantin, J., and Matruchot, L. Recherches sur le vert de gris, le platre et le chanci, maladais du blanc de champignon. Rev. Gen. Bot. 6 : 289-300 Illus. 1894.

(*Reprinted with permission of the Author and with acknowledgment to : " The Plant Disease Reporter," issued by The Plant Disease Survey, Division of Mycology and Disease Survey, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Division, United States Department of Agriculture. Volume* 31. *Number* 11, 15*th November*, 1947).

EXTRACTS FROM

A Mushroom Grower's Diary

19th June—*Wild mushrooms are on the markets again. These and hot weather and soft fruits have sent prices down to as low as 2/-. Even lower : one sender complains that his consignment ended at the lowest luxury level—the destructor.*

22nd June—*When my soil dries on the surface many of the small lumps take on a whitish appearance. I notice this again to-day but am puzzled because the bed was watered only yesterday. Close examination under the lens shows millions of white, almost stationary mites, giving the lie to dryness.*

23rd June—*Truffle, mentioned last quarter, failed to develop with the hot weather. This doesn't square with the books. Could it have been my drying out of the affected parts or just that Truffle " vanished " ?*

26th June—*One who gathers wild mushrooms assures me the heaviest crops are always picked at full moon.*

6th July—*The Soil Association at the Royal Show have two plots of soil sown identically with various vegetable seeds. Both had 1½" of sod removed in March. On one plot seeds were sown without further disturbance of soil. On the other the soil surface was broken with a hoe to a depth of 2" before the seeds were sown. Compost was top dressed on both plots after seeding. The plot without soil disturbance produced the best and cleanest plants, disease and fly free. Yet ironically the greater part of the Royal was given over to machinery, where thousands of pounds are spent on methods of ploughing, breaking-up and deep-cultivating soil. Who's right and who's wrong ?*

18th July—*The best fertiliser, I learn, for pine trees is pine needles. Do mushroom spores dropped from open caps either* (a) *fertilise the bed or* (b) *produce in due course more fruit-bearing mycelium ?*

26th July—*My outdoor beds have just finished at about 2 lbs. per sq. ft. Laid down in October, they were planned to crop in Spring, but maximum production was in the coldest weather ! Costs have been negligible. Nature was harnessed to the job, manpower only being taken for removing covering, picking and mild trashing. One heavy spray of gammexane took care of flies.*

30th July—*This hot spell is just right for holiday-makers but exactly wrong and sure to be costly for mushrooms.*

2nd August—*I have read somewhere that mushroom houses are unpleasant places to work in. Need they be ? Given light (not sunlight, of course), concrete floors, daily cleanliness and plenty of fresh air—the last two highly recommended —work may be easy and pleasant, warm in winter, cool in summer. (Compare with dust, bustle, rush and noise of a factory.) Is it really necessary to slosh water all over the place to guarantee lumbago rather than mushrooms ? I've seen some outstanding crops grown in airy houses with dry floors. In fact only easy chairs (not recommended) were lacking for the last word in comfort.*

7th August—*Cecid maggots all over again. Once more not a fly to be seen.*

18th August—*My last 18 crops have averaged 2·4, representing an average 1lb. rise. But now I am mortified ! Another grower has had a 1 lb. average rise too over the last 8 months. His figure ? THREE point four ! There's always another hill beyond the last rise !*

20th August—*In my note of 26th May I said D.D.T. smokes appeared to account for cecid larvae. Yet the larvae reported on 7th August have seemingly all vanished without the aid of any insecticide whatever.*

2nd September—*A member experimenting with outdoor ridges bemoans the fact that he has to clear the beds of mushrooms before he can case !*

8th September—*A member reports buying 5 tons of manure the invoice for which was altered by the lorry driver during transit to 8. The same member took an alleged 25 tons off rail and weighed it out to 11. The moral is obvious.*

10th September—*In the last Bulletin Sir Oliver Leese asked how many were willing to pay £10 a year for Research. It seems there has been only one reply. I confess I didn't reply. What an apathetic crowd we are. Are we blind that as the horse dies out we cannot see the whole industry is in danger ? Where do we expect help to come from ? What fools we are ! £10 a year from every grower in the country would pay for full-scale research without Government help. If that's unfair what about £1 per 1,000 sq. ft. per year with an upper limit of £20. That too would pay for it. Think it over. Write to me, to Sir Oliver, or to the Secretary. Sir Oliver is fighting hard for some research for the industry as a whole. Can't you promise him a quid per Thou ?*

Fred. C. Atkins Thinking Aloud .....

Loose Ends and Slipshod Terms

In franker moments we all agree we know very little indeed about mushroom growing, except that with application and luck we most of us make a profit on the year's working. Why do we case a bed? What causes a bed to fruit? Why does a bed fruit in flushes? Any of these and a score of other basic queries would provide controversy for a lengthy meeting, and no one really knows the complete answer.

Why then does my name appear so frequently in these pages? Do I pretend I know the answers? Of course I do not. I do try to make my articles accord with fact as far as I can—though I hope no one accepts what I write as 100% correct. In the last Bulletin, remember, I stated that the mycelium of *Dactylium* developed a delicate pink flush as the spores matured and lower down on the same page added a note to the effect that the spores were colourless! I had always assumed this pink colouring was due to the spores, but obviously I was wrong. I still have no idea what causes it, and the only suggestion I have heard is that "it is something to do with contact with the casing soil." Perhaps one of our Honorary Advisory Members will tell us the reason?

When I am asked to write a technical article on some aspect of mushroom growing, or to prepare a digest of published data, I invariably discover that the preliminary study of relevant papers teaches me much that I did not previously know and reminds me of more that I had forgotten. I still hold the belief that I learn more by writing an article than any reader does from reading it—and I get paid for it!

Admittedly much of the confusion is only of academic interest, but we really are very slipshod. A little tidying up is long overdue. In this country, at any rate, we have now agreed that White Plaster Mould shall be called *Scopulariopsis fimicola*, and not *Monilia fimicola* or *Oospora fimicola*; and it seems that Mat Disease is caused by *Myceliophthora lutea* and not a *Sporotrichum*. When we steam-sterilize our casing soil we don't really "sterilize" it; we partially-sterilize or "pasteurize" it. Etc., etc.

And while I am in this mood, what about all those loose ends—I mean investigations begun and arguments opened, only to be suddenly dropped without any conclusions reached? Take stroma as an instance. Mr. Noble discussed stroma in Bulletin 5, giving members the benefit of his long experience in overcoming it. The next Bulletin carried a typically-vigorous retort from Mr. Middlebrook, denying that any form of stroma was caused by the condition of the compost (as Mr. Noble had declared) and contending it was the result of "a soil moisture condition."

Here we had two thoroughly practical men at loggerheads over the causes of a phenomenon known to us all and giving us all anxiety from time to time. As Editor at that time I sat back to enjoy the ensuing fireworks—but nothing happened. We got nowhere. Yet here was an opportunity to get down to brass tacks and find out what really caused stromata and what could be done to prevent and overcome them.

This Folic Acid Business

by

MAJOR J. JONES

I have read in the M.G.A. Bulletin one or two brief references to the FOLIC ACID content of mushrooms. Not having the remotest idea what folic acid was I made it my business to see what I could find out about the subject.

From what I have read it would appear that here is a subject of first rate importance to all mushroom growers. Here at last is a more concrete and tangible reason for the existence of the mushroom. No longer can you class it only as a ' food item ' or ' a variation in the dull national diet.' It becomes at once one of life's essentials, for in the words of Paul de Krief ' the human body must have a certain amount of folic acid or it will perish.'

The name folic acid was given to this substance by Dr. R. Williams, of Texas University. It was so named because it was found in the foliage of spinach ; it was also found in other foods –in mushrooms, soya beans, yeast, kidney and raw liver. Will you please note the order of priority in which this life giving vitamin is found ? It would appear that the mushroom gives pride of place only to spinach—although I am open to correction on this point as I have not yet been able to procure the scientific publication on the ' Synthesis of pure Folic Acid.' (*Note* :— This was published in the United States in August, 1945, by the Calco division of American Cyanamid.)

It will be observed that I refer to folic acid as a life giving vitamin. In the literature I have read it has been variously described as ' the youngest brother of the B vitamins ' and ' a new blood-building vitamin.' As far as I can understand—being a mere layman folic acid stirs up the megaloblasts (giant cells of bone marrow) and makes them perform their proper function, which is to make the red corpuscles, which are essential to life and health.

I gather that the treatment has been given for various types of anemia, including pernicious anemia, for some cases of expectant motherhood in which the blood is dangerously thin, in cases of anemic undernourishment, and that it is also being tried out in cases of anemic decline due to old age. So far as we mushroom growers are concerned the point at issue would appear to be :—Can it be proved that consumption of mushrooms at fairly regular intervals will provide the human system with sufficient folic acid to maintain a properly balanced supply of red blood cells –or can it even contribute to the cause ? If so, then mushroom production must step into its rightful place of supplying one of life's essential commodities. There is an obvious need for more enlightenment and knowledge on this subject but I am of the opinion that this may well prove to be one of the keystones on which a vastly increased mushroom business of the future will be built.

I feel sure that many of us growers will be interested in the further development of this folic acid business and I personally would be most interested to know more about the subject.

JOHN B. YODER, *Chemical Engineer, Butler County Mushroom Farm, Inc., gives more details of :—*

THE TWO-ZONE TRAY SYSTEM IN PRACTICE

The two-zone tray system as described by Dr. James W. Sinden in one of your recent bulletins is being used successfully by a number of growers here in America, including The Butler County Mushroom Farm. It is especially suitable for mine or cave growing where fumigation and other disease control methods are difficult to employ and where diseases are aggravated by the high humidity usually present in such places.

The use of specially constructed houses for pasteurizing the compost and growing the spawn assures the mushroom crop of a good start under relatively sanitary conditions. The beds or trays are then transferred to the growing zone for production and picking of the mushrooms. At The Butler County Mushroom Farm the growing zone is an abandoned limestone mine which has a temperature of about 55° F. and a humidity above 95% throughout the year.

The tray system lends itself readily to mechanization which is possibly its most important advantage. Perhaps this part of it can best be explained by a brief description of our operations by which the filling, casing, dumping and moving of the trays is done mechanically.

The trays used are 4 ft. by 8 ft. by 6 inches deep in size, affording approximately 30 sq. ft. of growing area. Since, even when empty they weigh about 250 lbs., it is necessary to move them mechanically. This is done by electric hoists and lift or fork trucks.

The casing and filling machines are similar to one another in theory of operation and consist essentially of two horizontal conveyors and hopper. One conveyor carries the trays. Directly above and parallel to it is the other conveyor onto which the hopper feeds the soil or manure. The upper conveyor not only feeds a layer of manure or soil to the trays on the lower conveyor but provides a place for the manure or soil to be levelled off.

When the trays are filled with the compost they are taken to the pasteurizing houses and after heating are spawned by broadcasting grain spawn over the surface of the bed. By using this method of spawning it is possible to stack 14,000 sq. ft. of trays into a pasteurizing house 60 by 30 by 15 ft. in size, leaving only enough room between the trays to scatter the spawn over the surface.

After the spawn has grown, which takes about 21 days, the trays are taken out of the houses and passed through the casing machine. They are then hauled into the mine for the mushroom production. Hauling the trays in and out of the mine is done with tractors and trailers. The trailers are converted bomb trailers each designed so that it will carry four trays. Each tractor will pull a train of six trailers.

Mushrooms are picked off the trays for approximately fifty days after which the trays are hauled out and dumped. Due to the relatively short picking period and except for cleaning mycogone and mildew, little effort is spent in trashing the beds.

Generally speaking, it seems to me that the two-zone tray system should appeal to the larger grower who wants to be in continuous production every day throughout the year. For such a grower, labour-saving machinery quickly repays the cost of its original investment. Then, too, continuous operation permits his workers to become specialists and experts at their specific jobs.

ITEMS OF GENERAL INTEREST

Workers in horticulture can be exempted from military service if the C.A.E.C. certifies their work is essential for food production.

Mushrooms are being experimented with at the Land Settlement Association's holdings at Elmsthorpe, Leicestershire, and for this purpose a ' house ' with a wooden inner wall and an outer wall of baled straw, covered with pig wire thatched with straw, has been erected.

Only by co-operation between growers, and by pooling ideas, difficulties and problems, could we hope to build a prosperous industry, said Mr. Hugh Sumner, C.B.E., of Worcester.

Mr. E. W. Buck, mushroom manager at Worfield Gardens (General Sir Oliver Leese's estate), spoke in the B.B.C. Midland programme on 20th June, on " Mushroom Growing and the Backyarder." The *Radio Times* reported : It was during a jungle drive in the Burma campaign that Sir Oliver asked his driver, " What do you want to do when the war's over, Buck ? What do you think of the idea of growing mushrooms at Worfield ?" Mr. Buck thought it a grand idea and there he is now in charge of mushroom sheds that produce 400 lb. of mushrooms for the market weekly.

A member writes in to say " a Lady X, whom I have the honour of knowing, has been ordered mushrooms by her medical adviser."

WHAT ABOUT OIL FIRING ?

About one-third of the world's oil reserves are in the Middle East. Owing to wasteful methods of exploitation of domestic supplies, the U.S.A. is increasingly interested in this Middle East oil. The U.S.S.R. is interested too. But, for Britain, Mosul and Abadan are not merely an important supplement to existing domestic supplies they are her major sources of oil ; and both are dangerously exposed, strategically and politically. Politically because the oilfields are in countries which do not belong to Britain. A hostile power, therefore, by ideological warfare, can easily exploit the natural hatred of foreign capitalists. Strategically, because the oilfields lie at the end of long lines of communication across the territory of independent Arab states. Though Suez has become of secondary importance to British strategy, Mosul and Abadan have become essential to British independence. (R. H. S. Crossman, M.P., in " Palestine Mission," 1947).

Sewage Sludge and Mushrooms

ALTERNATIVE GROWING MEDIUM?

A number of enquiries come to M.G.A. headquarters regarding the possibility of actuated sewage sludge plus straw as a growing medium for mushrooms. **Mr. H. J. Holford,** Technical Director of Holford Processes Ltd., who originally broached the subject in the 1946 Year Book for Mushroom Growers, was invited by the Editorial Board to contribute a statement on the position to-day.

"The position," he says in reply, "is the same as when I wrote my original article. My Company does not manufacture any products, but are solely engaged in the perfecting of scientific processes for ultimate disposal, so we could not commence any form of commercialization of this valuable material. The Agricultural Research Council, in 1945, strongly recommended that we should either make the fertilizer ourselves, or licence the process to some firm of manure manufacturers. These suggestions were not successful, and it seems that vested interests in the imported artificials resolutely opposed the introduction of such a cheap, but rich, substitute for the chemical substances imported or made synthetically here.

We have offered the formulas and our research data to a few British fertilizer firms, especially during the late war, but although they approved the system of manufacture and the value of the materials, they resolutely declined to set plant aside to turn out the stuff in bulk quantities. The Ministry of Agriculture likewise declined to support its production, but admitted that it presented a number of advantages for farmers short of farmyard manures.

If you will refer to the Patent Specification (Brit. Pat. No. 572171) the system is disclosed in some detail, but since the patent was granted we have made a few alterations, particularly in regard to apparatus required for manufacture. I regret I have no printed copy of this specification, but you can get a copy of this from the Sales Department of the Patent Office, London.

I have however a copy of our earlier memoranda upon the utility of this valuable substance, and therein you will find a brief summary of the process and the products recovered thereby. (*Note* :—This paper has been placed in the M.G.A. Library).

The only way in which this immensely practical and nationally valuable material can be developed would be under the auspices of some go-ahead industrialist, or an association, and in this direction I suggest that this letter and memo. might be investigated by your members.

Of course research on wider lines than I have entertained will definitely enhance the great possibilities of the waste sludges in this country as composts, and if the members of your Association are prepared to entertain such investigations a nationally-invaluable product would result, to provide your members with a substitute of horse-manure for composts.

I will gladly provide you with any technical details required, and do not hesitate to write me thereon at any time."

Celcure Treatment of Bed-boards

By **C. W. NICHOL,** *Managing Director, Celcure Limited*

When timber was in unlimited supply and its cost was low, users could afford to waste it. To-day, timber is scarce and costly, licences are hard to come by. It is therefore essential to make it last as long as possible.

The principal, and perhaps the only cause of timber replacement in mushroom houses is fungus attack, commonly known as rot. Since mushrooms are themselves fungi, the conditions suitable for their propagation are equally favourable to the development of destructive fungi in the timber. Conversely, the application of preventive chemicals to the timber has hitherto been found difficult without corresponding injury to the mushroom mycelium or to the mushrooms themselves.

Creosote has been tried by many growers, but on account of its powerful fumes and its propensity for bleeding out of the wood into the compost, this preservative cannot be employed for bed-boards in its most effective form ; namely by vacuum and pressure impregnation. The usual method adopted by growers is to brush or spray the creosote as thinly as possible on the surface of the timber, and afterwards to season the boards until the fumes have abated and the creosote has ' dried.' It is, however, now widely recognised that such treatment can, at best, give only moderate and temporary protection to the wood, while the danger of contamination of the compost and atmosphere remains in direct proportion to the quantity of creosote applied.

The essential requirements for a wood preservative for this special purpose may be summarised as follows :—

1. It must penetrate deeply and render timber lastingly immune from fungus attack.
2. It must emit no fumes harmful to either the growth or colour of mushrooms.
3. It must neither bleed out into the compost nor wash out on to the bed below when the treated boards are sprayed with water.
4. It must be inexpensive and readily obtainable.

Over the last two centuries an enormous number of substances have been experimented with for the preservative treatment of timber, but until comparatively recently, coal tar creosote has reigned supreme, so that the words preserving and creosoting have become almost synonymous. In this age of progress there is, however, nothing which is incapable of being improved upon, and with the rapidly increasing knowledge of chemistry during the present century certain combinations of water soluble chemicals have been evolved which, after more than 20 years of testing under all conditions of use, are now generally recognised and accepted as at least equal to creosote in effectiveness, with none of its disadvantages for certain types of employment.

It is not sufficient, however, that a preservative should be good ; it must also be suitable for application to timber in an effective manner, and be so applied. There are many preservatives of very high toxicity

to fungi and insects which are only suitable for surface application by brush, spray or dipping. While such methods of application are of some value where limited protection is sufficient, they are quite unsuitable where the timber is to be exposed to severe conditions of fungus or insect attack—such as in a mushroom house. Given a good preservative, the only method of application which will ensure the complete and lasting protection of timber under such conditions is vacuum and pressure impregnation.

The search for a suitable preservative is, therefore, now narrowed down to water-soluble chemical combinations suitable for application under vacuum and pressure, and having the requisite degree of fixation in the timber and safety in use in a mushroom house.

An outstanding preservative of this type is a combination of copper sulphate and bichromate known as Celcure, which was invented some twenty years ago, and after the severest possible tests under all conditions of exposure in the intervening period, is now being widely used in this country and abroad. Its properties are such as to permit its use under conditions where preservative treatment has hitherto not been possible, such as interior floors in dwelling houses, timbers in contact with plant life or with foodstuffs and other similar conditions.

Unlike all other preservatives, Celcure does not rely for its effectiveness upon the poisoning of fungus and insects attacking the treated wood. When Celcure is applied to timber, a chemical reaction takes place between the active salts and the constituents of wood. This results in the formation of copper chromate, which is insoluble and permanently fixed in the ligno-cellulose structure, so that it cannot bleed or be washed out with water. At the same time the cellulose—the food which attracts and sustains fungi and insects—completely loses its food value.

Thus, although wood destroying fungi are no longer able to obtain nourishment from the treated wood, edible fungi growing in close proximity to it are entirely unaffected.

The effectiveness of Celcure has been tested over many years by the Forest Products Research Laboratory, Princes Risborough, and its importance is such that a British Standard Specification is shortly to be issued in respect of this preservative. The increase in service life given to timber by Celcure treatment has been abundantly demonstrated. Service tests of railway sleepers over nineteen years, marine timbers over fourteen years in the sea, cooling-tower timbers, building timbers, fencing, ship and refrigeration work, greenhouses, and many other types of construction are described in the manufacturers' brochure. Of particular interest is a service test of Celcure-treated mushroom bed-boards which, after 12 years constant use, are still as sound as when first installed. No adverse effect upon the mushroom production has ever been noticed. Untreated boards used under the same conditions are said by the growers concerned to have a life-time of only one year.

There is a nation-wide organisation of impregnating plants carrying out Celcure treatment at the timber ports, so that instead of ordering untreated wood, growers merely have to ask for Celcure treated material, which can readily be obtained through their usual suppliers.

The cost of treatment varies from £9 10s. 0d. per standard (1/2d. per c. ft.) to £10 10s. 0d. per standard (1/3¼d. per c. ft.) according to the quantity and species of timber. Treatment thus adds only about one-eighth of the cost of the timber.

All planing, cutting, or other fabrication should be carried out as far as possible before treatment. If subsequent cutting is unavoidable, the cut surfaces should be liberally brushed with the special highly concentrated grade, Celcure 'B'.

Immediately after treatment the Celcurised timber is wet and should be carefully open piled for air drying for about three weeks before being used. In order to avoid the consequent delay in delivery, many timber merchants are now carrying stocks of Celcure-treated wood, dried and ready for use, in the sizes required by their regular customers.

After treatment and drying, it sometimes happens that small quantities of surplus unfixed salt remain on the surface of the timber. For mushroom-house work it is therefore advisable that the timber should be thoroughly sluiced down with water before use.

The life-time of existing bed-boards and other timbers can be considerably increased by the application of Celcure 'B' to all surfaces. It must again be emphasized, however, that the protection given by this method of application is not comparable with that of pressure treatment, which should be utilized for all replacement timbers. Celcure 'B' is supplied in liquid form ready for use without dilution. It cannot be applied to timber which has previously been creosoted, unless the creosote has completely dried out so that no oil remains on the surface of the wood.

For the eradication of existing fungal attack, all badly infected timbers should be removed and burned at the first opportunity, being replaced with pressure treated material. Timbers showing only slight signs of attack may often be saved by liberal treatment with Celcure 'B'.

Celcure treated timber is clean in appearance and handling and is entirely without smell. The process is equally suitable and desirable for all timber used in the mushroom farm, including bed-supports, the walls and framing in wooden houses and the roof supports in composting sheds.

There is little hope of any substantial increase in supplies of imported softwood, or of the relaxation of the present high prices, for many years to come. By obtaining the maximum service from the material now available, the grower will not only help to reduce the drain on the world's forest resources, but will benefit by substantial savings in future maintenance and production costs.

AN ABNORMAL GROWTH ON MUSHROOMS

by Dr. W. A. R. DILLON WESTON
and Dr. R. ERIC TAYLOR

A bed of mushrooms was grown by one of us on the concrete floor of a disused garage. The bed was prepared, cased and spawned in the orthodox way, with the exception that the depth of compost was rather shallow so that on various occasions it was necessary to apply water.

There was relative freedom from fungal and insect pests, but slugs frequently invaded the bed. Excellent yields were obtained and no abnormalities of growth were noted with the exception of one fructification. A slight corrugation was noted on the pileus of this when it was about the size of a chestnut, and this developed into a knob-like intumescence which, a fortnight later, had attained the dimensions shown in the illustration. The peculiar folds and convolutions of this knob-like excrescence, resembling somewhat a rose-comb found in some breeds of poultry, consisted of a hymenium bearing basidia and basidiospores. The gills on the under-surface were normal. It was thought that this abnormal condition might have been caused by some slight mechanical

irritation to the skin of the pileus, but attempts to reproduce the condition by scratching the surface of a number of caps with a sterilized needle failed. Reference to the literature showed that a similar condition had been described by Lambert (1930), and referred to by Messrs. Darlington and Sons Ltd. (1934) and Brockhuizen (1937), the term applied to it being the ' rose-comb ' disease. Lambert (1930) correlated the incidence of this disease with the use of some form of mineral oil in the mushroom houses, and Brockhuizen (1937) induced it by the use of oilstoves or by the fumes of coal-tar creosote. These mushrooms were grown in a garage where oil had been stored, a condition which (according to the above writers) might be conducive to the disease. Berkeley (1836) described ' a most extraordinary and beautiful state of *Agaricus campestris*,' and referred later (1860) to a somewhat similar condition observed in several species of *Agaricus* in which ' an hymenium is produced on top of the pileus as well as beneath . . . .' Teratological specimens of *Collybia* spp. have been described by Buller (1924) and Ramsbottom (1933) and of *Coprinus ephemerus* by Keyworth (1942), and the nature of these appears to be somewhat similar to that described in the present specimen. We are indebted to Mrs. W. A. R. Dillon Weston for bringing this specimen to our notice.

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The two Bulletins which you forwarded were warmly welcomed. Your Association is much to be envied and I only wish we had one so active here. Good luck in your crops!

John B. Yoder, Butler County, Pa., U.S.A.

Although a co-member of the M.G.A. with my brother, I have derived so much interest and profitable help from my being so, that as a small mark of appreciation I would like independent membership in my own name. A. N. Fell.

With reference to the article ' Is research undesirable,' the anonymity of the writer is understandable. It is, however, not so long ago that mill machinery in the North of England was wrecked by hand loom operators because they feared unemployment. There is no evidence that textile manufacture was unduly retarded by invention or that unemployment was caused thereby! R. Duthy.

PRESS CUTTINGS

SERVICE BEFORE SELF. Service to the consumer before profits should be one of the guiding aims of a business man. This is not quite so easy as it seems, especially when the business is small and struggling. It involves growing for quality before weight, seeing that the produce gets to the consumer by the shortest route and in a fresh condition.

A. R. WILLS, in *The Grower*, 21.9.46.

STANDARD PACKS. Whilst all sections of the trade appear unanimous in their desire to see a return of standard packing and grading, the present time might well be an opportune moment to examine the question of standard types of package, measures and weights, to be adopted when conditions permit.

Fruit, Flower and Vegetable Trades Journal, 26.6.48.

LOST GOODS WARNING. Recently a trader made a purchase and received an advance invoice stating that the suppliers would not be responsible for lost goods unless the customer gave notice within ten days of his getting the invoice. The goods did not arrive ; the firm were so advised after expiry of the ten days ; they sued and were given judgment for the full amount.

Nurseryman and Seedsman, 15.7.48.

IMPORTS. Imports of fresh fruit and vegetables have provided our population with only $1\frac{3}{4}$ lb. a head in five months, says a Government spokesman. Very well. Is it worth wasting so much foreign exchange for so little return ? Is it worth sending the home producer into an anxiety neurosis for so small a benefit to the consumer ? Would it not be better to encourage home growers to provide that little extra ?

Leader in *The Grower*, 12.6.48.

SEX HORMONES AID MUSHROOMS. Sex hormones are believed to explain the superiority of stallion manure in mushroom growing, but so far workers who hold this theory are not ready to talk.

The Grower, reporting on Cheshunt Members' Day, 5.6.48.

Editorial Note : Mr. Richards, the manager, told visitors that of 24 *sex hormones which had been investigated,* 18 *were of interest in mushroom growing. At this stage nothing more has been reported.*

ALTERNATIVE TO HORSE MANURE ? We use, as a growing medium, equal parts sifted fibrous loam and dried powdered poultry droppings. In all our experience we have found this alternative to horse manure very good indeed. The powdered droppings and the loam are turned over twice, the second turning being 3 to 4 days after the first. There is some fermentation, just enough pleasantly to warm the medium .... We make up (our six inch beds) firmly .... No soil casing is put on here. The beds are kept pleasantly moist, and in about seven weeks a good crop of mushrooms commences to appear.

"Onward" in *Fruit, Flower and Vegetable Trades Journal*, 29.5.48.

EXPERT DISGUISE. My husband hasn't been a mushroom grower for long, and when he started he wanted an expert opinion on the condition of his first load of manure. The expert arrived and my husband was astounded to meet a tall, very smart ' she ' in tailored suit, silver fox, immaculate white gloves, etc. My husband felt rather diffident about asking this splendid creature her opinion of the large, steaming, odoriferous mountain of manure, but as he hesitated she strode forward, peeling off her spotless gloves as she went. She then grabbed a handful of the mess, rubbed it between her fingers and inspected it carefully. He said, " I nearly fell down "—but after he had recovered she was able to help him quite a lot.

A Correspondent in *Woman*, No. 577, 1948.

MANURE SUPPLIES. The problem of supplies of stable manure for mushrooms to West Sussex becomes increasingly difficult and our suppliers have warned us that our orders may have to be cut in some cases, so keen is the competition for the supplies available.

West Sussex Correspondent of *The Grower*, 24.7.48.

Honour for Col. Shewell-Cooper

Colonel W. E. Shewell-Cooper (who incidentally was the first Honorary Education and Advisory Member of the Mushroom Growers' Association, and has written articles for the M.G.A. Bulletin) was in the Birthday Honours honoured by His Majesty the King by being made a Member of the Order of the British Empire.

Colonel Shewell-Cooper, M.B.E., N.D.H., F.L.S., F.R.S.A., F.R.H.S., is Command Horticulture Adviser to Eastern Command and it was he who first taught General Sir Oliver Leese mushroom growing by running a course on mushrooms for the Army. At that course Doctor W. M. Ware was one of the lecturers. In addition to his work for the Army, he is Principal for The Horticultural Educational and Advisory Bureau, and travels about all over the country advising growers and market gardeners. He has been the means of persuading many to join the Mushroom Growers' Association. He is incidentally the author of 26 books on horticulture, some of which are standard works on the particular subject concerned and others which are recognised as best sellers. He has recently returned from a lecture tour in South Africa.

RADIANT HEATING

NEW SYSTEM FOR MUSHROOM HOUSES

A method of heating which solves three problems involved in growing mushrooms—maintaining an even constant temperature, eliminating draughts, and permitting air to remain moist—is described in a recent issue of the American publication, "*Market Growers' Journal.*"

Wrought iron pipe coils, fabricated in the form of grids, are embedded in the concrete floor of the mushroom house, and hot water is forced through. The temperature of the concrete is raised and heat rays emanate through the floor. The system is referred to as "Radiant heat."

The Journal describes one large mushroom farm—The Lescarboura Mushroom Co., Kelton, Chester County, Pa.—at which, prior to the installation of a radiant heating system, it had been noticed that the bottom bed acted as a 'buffer' against the cold floor, with the result that only seven of the eight tiers could be counted on for productivity. The report states:—

"Now all beds are productive, and surprisingly enough the bottom bed contains the healthiest and fattest plants. On this mushroom farm, each 'double' in the growing rooms has its own radiant-heating grid, 20′ wide and 56′ long, made up of 1″ and 1¼″ pipe. Supply and return mains of 2″ and 1½″ pipe run from the boiler room in the building to the twelve heating grids. Wrought iron pipe is used throughout because this material is resistant to corrosion, expands at virtually the same rate as the concrete in which it is bedded and is easily bent and welded. Wrought iron pipe was also used for well and pump house lines. About two miles of pipe were used for the entire installation."

The Radiant Heat Engineering Co., Inc., of Johnson and Alexander Avenues, Linwood, Pennsylvania, have made a thorough study of the technique of radiant heat systems. In a letter to the Secretary they say: "We find usual practice carries floor pipe coils in a concrete slab not over 6″ thick. Normal small jobs have slab thicknesses ranging between 3″ and 4″. We like to caution the general contractor to have the slab of sufficient thickness to provide a coat of concrete at least 2″ from top surface of pipe in slab to the ultimate surface of the finished floor.

"Normal practice and results on our many jobs indicate unfailing satisfaction by adhering to a formula:—Maximum upward load of 85 B.T.H. per sq. ft. of floor surface with a mean temperature that does not exceed 80 to 85°F. These surface temperatures are not uncomfortable, being less than skin temperature, and appear to be universally satisfactory.

"We as heating installers have nothing to do with the concrete mix but, at the same time, know the suggested practice is to use a broken stone or gravel fill direct on the ground; instal the wrought iron pipe coils thereon and, after testing the piping system, a stone aggregate concrete slab is poured overall.

"We hope the foregoing data will be of real interest and value to you. We stand in readiness to supply further assistance or—at the same time —are glad to refer you to A. M. Byers Company, Pittsburgh, Pennsylvania, pioneers developers of radiant heating in the U.S.A."

Mr. Patrick P. Capossere, President of the Radiant Heat Engineering Co., Inc., has very kindly presented to the M.G.A. Library a booklet on this subject : "*Byers Wrought Iron for Radiant Heating*," which provides a mass of technical data. The introductory paragraph states : "Two thousand years ago at Bath, England, radiant heating was used by the Romans. Hot gases from charcoal fires were circulated through ducts to warm walls and floors, just as wrought iron pipe coils are now used to warm room surfaces. Mr. A. H. Barker, an English inventor, re-discovered the principle of radiant heating about 40 years ago when he noticed that at the same air temperature one room in his house was more comfortable than another, due to the warming of the more comfortable room by furnace flues. By embedding pipes containing hotwater in the walls of other rooms he was successful in producing similar effects. Following his discoveries radiant heating developed steadily in England and there have been recorded something over 1,000 radiant heating installations in England and France alone."

CORRESPONDENCE

The common mushroom (*Psalliota campestris*) is not popular, but the *Cortinellus Shiitake* is cultivated everywhere in Japan. The dried *Cortinellus* is exported all over the world. The peculiar odour and good taste are both relished by every nation. Since the discovery of rich content of Ergosterin (Vitamin compound), the *Cortinellus* is also used for pharmaceuticals. I want to find some pioneers who will rear it on trial in your country. MASATOMI OHGA, Japan.

All went well with the mushroom growers in Australia until 1939, but business dwindled during the war, and now that Australia is experiencing a wave of industrial prosperity, with a forty-hour week for all workers, many would-be mushroom growers prefer steady jobs in industry. Another obstacle—though this is not new - is the great distances between capitals. However, there are in New South Wales more growers than in any other State, the largest grower having about 10,000 sq. ft. Others have as little as 500 sq. ft. in improvised sheds. Outdoor growing is becoming more popular . . . . The average wholesale price to-day (February, 1948) is 3/- to 4/6 lb., retail 5/- to 7/- . . . . We have not reached a production that warrants drying or canning ; when we do, it will be mainly for export, as the Australian public lacks the lavishness of the English and Continental well-to-do.

R. MAS, Sydney, N.S.W.

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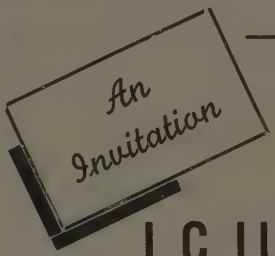

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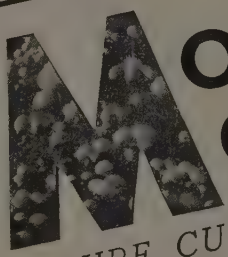

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Mr. J. Stewart-Wood, of Ford, near Aylesbury, is one of the younger members of the M.G.A. Executive Committee and he started mushroom growing in 1934 and has been in business ever since, except for the war years spent flying in the R.A.F.

His views are that owing to the restrictions on building materials and horse manure, production cannot be greatly increased and markets should remain steady, and that all growers should contribute to get research on a firm footing.

A Record Attendance
is confidently expected

at the

THIRD

LUNCHEON

and

ANNUAL GENERAL MEETING

at the

Restaurant Frascati
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TUESDAY, 23rd NOVEMBER
1948

TICKETS for the Luncheon (10/-) have had to be limited. Early application to the Secretary is advisable

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